BRUSH CONNECTORS USER APPLICATION INFORMATION

The Brush B³ connector is a highly sophisticated, innovative low mating force device designed to provide a multiplicity or highly redundant number of contact sites for high density, high performance applications. Contact resistance is stable and low, approximately 1/3 lower than the most widely available contemporary two piece printed circuit card connector type. To maximize the B³ connector capability and assure the greatest potential reliability, several guidelines should be followed.

Ideally, connectors should be fully mated and not used as a packaging system tolerance absorber. Full mating occurs when the two molded thermoplastic contact housings (connector bodies) touch, plug skirt to receptacle shoulder over the entire length of the connector. However, manufacturing tolerances and user installation procedures must be considered and can be expected to prevent the “ideal” situation.

Connector bodies were intentionally designed to be non-rigid as permanent flexibility is necessary to allow compliance to user printed circuit cards, fixtures and card cages. Vibration and shock exposure, thermal excursions, contact repairability, and differential expansion characteristics further dictate the desirability of flexible connectors.

Amphenol drawing call-outs of part flatness to a 0.010 inch FIM (Total Indicator Reading - Full Indicator Movement) over the mating surface length is to be interpreted as in an “as used” condition. Rigid mounting of Mother Board (plug) parts to frames, multi-layer printed circuit boards or back panels should consider the need for the 0.010 inch maximum condition after soldering or solderless wrapping procedures.

Normal Mother Board parts in an unrestrained, unused condition may exceed the “as used” 0.010 inch reading at normal ambient or storage environments. Thermal cycling may further aggravate or adjust the condition. These parts present a profile from flat to a “smile” appearance when viewed from the side with the mating surface uppermost. (For example, see photo above). Normal positioning of this part on the Mother Board with slight restraint through use of mounting hardware or standard mounting bolts will automatically impart compliance to the flatness condition of the board. Slight restraint is urged to allow for differential thermal expansion compensation during preheating and soldering operations. Final torquing or permanent fastening should be effected after cool down and thermal neutralization. Normal solderless wrapping procedures could ignore the differential expansion consideration.

Daughter Board connectors present the same flat to “smile” profile in a free state with the mating surface downward. The relief shelf can be used as a reference or guide when used with a straight edged Daughter Board or printed circuit board “page”. Once proper positioning is verified and contact tails are solder fixed to the plated through holes, straightness will be permanently retained.

During usage and when mated the worst case condition of the “as used” 0.010 inch maximum reading of both the plug and receptacle could cause a maximum gap between plug and receptacle moldings of 0.020 inch. This condition is well within the B³ product mated performance goals as our minimum effective electrical contact engagement has greater than a 100% safety factor. Users are urged to monitor the quality of connector installation to optimize the mating of connectors.

Input/Output connectors also normally exhibit a flat to “smile” profile with the mating surface downward. This “smile” condition self corrects once mated with the Mother Board counterpart and accessory locking screws are fastened. Again, checking for the 0.020 inch maximum gap is urged as a quality control monitor of user application techniques.

Amphenol has attempted to design in the ultimate for connector compliancy and self-correction during normal user installation procedures. The connector capabilities and inherent reliability rely in part on practical user procedures and application considerations. Refer to pages 93-95 for other installation instructions. And, refer to page 63 for correct mating of low mating force connectors. Amphenol board level engineers and product specialists are available to assist the user with application recommendations and processing guidance. Give us a call at 607-563-5011 and ask for board level technical assistance if further information is needed.
**MOTHER BOARD CONNECTOR**

MB connectors that are mounted on printed circuit boards should be installed on the board and held somewhat loosely, yet assuring all connector molding standoff pads contact the surface of the board, prior to soldering. There are several methods for attaching the MB connector to the board.

Inserting locking/mounting bushings with an arbor press is shown in the top photo at right. Locking/mounting bushing accessory, two per connector, may be inserted into 0.185 inch diameter CSK holes at each end of the front of a MB connector body. (Part number to order locking/mounting bushing is 10-41196-3). Using a light arbor press or similar device, firmly press the knurled section of the bushing into the lower 0.122 inch diameter hole until the front of the bushing is flush with, or slightly below, the front surface of the MB connector. Refer to Figure 1 at right. Make sure the bushing and hole axis are properly aligned. Avoid excessive force which may crack the back surface of the MB connector body. The back of the locking/mounting bushing has a 4–40 UNC-2A THD to mount the connector. Fasten the connector with a suitable washer and nut. The front of the locking/ mounting bushing has a 4–40 UNC-2B THD which will mate with the locking screw accessory of an IO connector.

**Alternate Mounting Variations for Mother Board Connector**

A clinch nut (such as all ESNA 79NCMA2-26 or equivalent may be pressed from the front, knurled end first, through the 0.185 diameter CSK into the 0.122 inch diameter hole at each end of the connector. An appropriate length 2–56 UNC-3A screw, washer, and nut may be used to mount the connector. Mounting forces should be applied to the bushing toward the rear of the connector. (See Figure 2 below)

If MB connectors are to be wave soldered to printed circuit boards, the boards should be fixtured to maintain assembly straightness prior to and during the wave soldering process. (Refer to Figure 4 below).
**DAUGHTER BOARD CONNECTOR**

DB connectors should be loosely held on the printed circuit board prior to and during wave soldering. Care must be taken to ensure that the board does not bow away from the center of the connector during the soldering process. Also, especially on long length daughter board connectors, care must be taken that the connector does not bow on the circuit board. (Refer to Figure 5.)

After soldering, mounting screws should be properly torqued. For cosmetic purposes, the board side of the DB connector can be masked prior to wave soldering to protect it from heat exposure and solder wash. Acceptable masking may be accomplished with split tubing, stainless steel, or Mystik Tape #7010 or #7367. (Refer to Figure 6). Printed wiring boards with DB connectors attached should be inserted into the housing until firmly seated. If possible, visual observation of the MB/DB mated condition is recommended. The fully mated condition occurs when the DB connector skirt bottoms on the MB or PC connector shoulder along the full length. (Refer to Figure 7). Printed circuit boards should be supported in card guides and locked in position when connectors are fully mated.

**PC CONNECTOR**

The PC connector should be loosely attached to the printed circuit board prior to any soldering of contacts. Locking bushing accessory, two per connector, may be inserted from the back of a PC connector body into large mounting holes at each end. See photo at right. Part number to order locking bushing accessory for PC connectors is 10-411196-4. The 0.126 inch diameter cross holes in the locking bushing must be aligned with the 0.126 inch diameter cross hole in the PC connector body. These holes accept a 4–40 UNC-2A screw which should be long enough to allow mounting to the board. Fasten with a suitable washer and nut, making sure an appropriate washer is also under the head. The front of the locking bushing has a 4–40 UNC-2B thread which will mate with the locking bushing accessory of an IO connector.
PC CONNECTOR, CONT.
The mounting surface to which the connector is applied should not extend forward of the shoulder of the PC connector. If the mounting surface does extend beyond the shoulder, a shim (minimum 0.005 inch thick) must be inserted between the connector body and the mounting surface. (Refer to Figure 8). After soldering, mounting screws should be properly torqued. Fixturing of the PC connector and mounting surface may be desirable to assure straightness after wave soldering.

INPUT/OUTPUT CONNECTOR
Use of mating hardware, such as locking screws, is recommended with I/O connectors. See photo at right. Locking screw accessory, two per connector, may be inserted into the large holes at each end of the back of an I/O connector body. Part number to order locking screw accessory is 10-411196-4. By hand, press the locking screw firmly down into the cavity until it reaches a positive stop. The locking screw is then captivated in the retention system of the cavity. The front of the locking screw has a 4-40 UNC-2A thread which will mate with the locking bushing accessories of MB or PC connectors. (Refer to Figure 9 for I/O locking screw dimensions).

Should it be necessary to remove the captivated locking screw accessory, push the screw as far forward as possible. Using vise grip pliers to grasp the threaded end and pliers to hold the knurled end, apply torque until the locking screw breaks in two. Each half will then drop out.

Alternate Mounting Variation for Input/Output Connectors
For fixed mounting, a 6-32 thread forming screw, type AB (MS5186) may be inserted through the mounting member and into the holes at each end of the connector body from the back. The screws must be used with suitable washers and must be of sufficient length to penetrate the connector body 0.350 inch. Care must be taken not to over-tighten the screws.

Visual observation of the mating of the MB connector to the I/O connector or the PC connector to the I/O connector is recommended. The fully mated condition occurs when the I/O connector skirt bottoms on the MB or PC shoulder along the full length. (Refer to Figure 10).

Printed circuit boards containing PC connectors that are mating with I/O connectors should utilize a holding device that is capable of locking the board in place to prevent back-off during use.